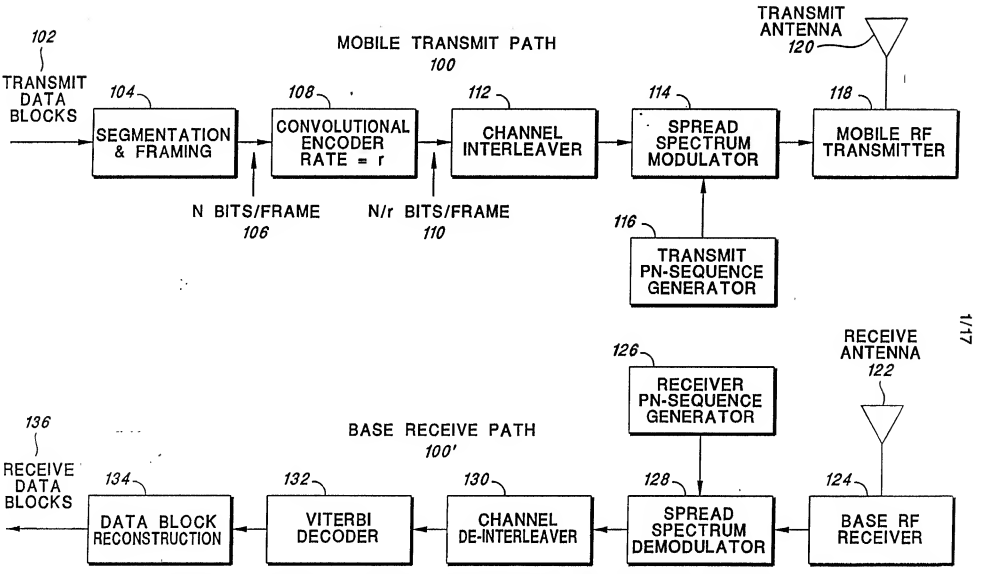
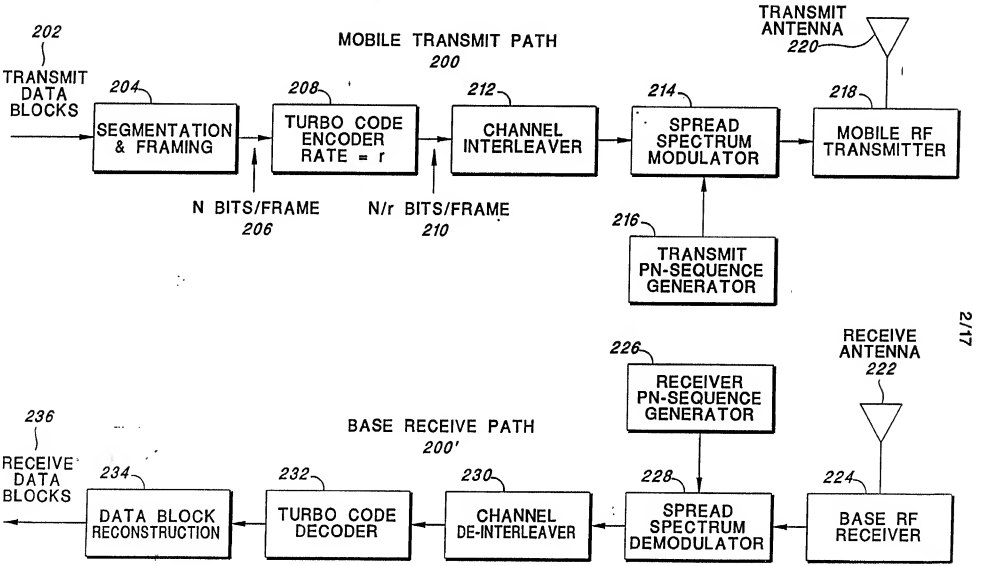


BLOCK DIAGRAM OF A DIRECT SEQUENCE CDMA DIGITAL CELLULAR MOBILE TRANSMITTER AND BASE RECEIVER

FIG. 1



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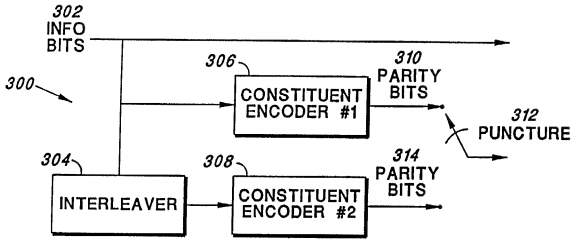
EXAMPLE OF A CDMA COMMUNICATIONS LINK USING TURBO CODES

FIG. 2



GENERIC TURBO CODE ENCODER BLOCK DIAGRAM

FIG. 3

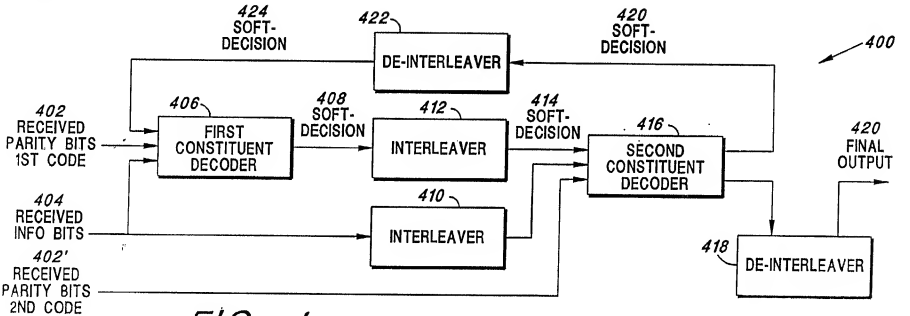


FIG. 4

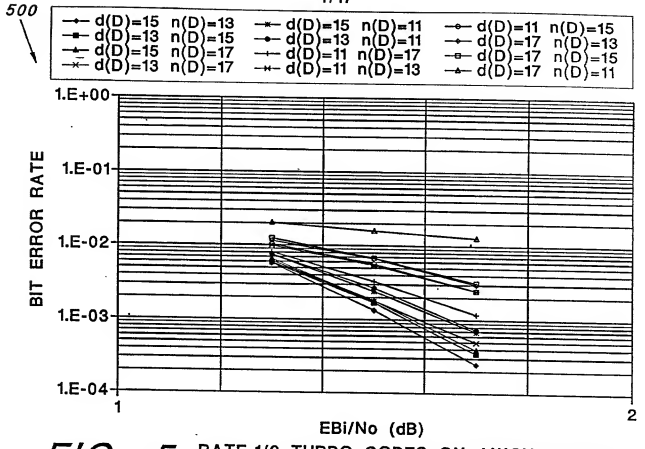


FIG. 5 RATE-1/2 TURBO CODES ON AWGN CHANNEL. (1000 BIT INTERLEAVER, 3 ITERATIONS)

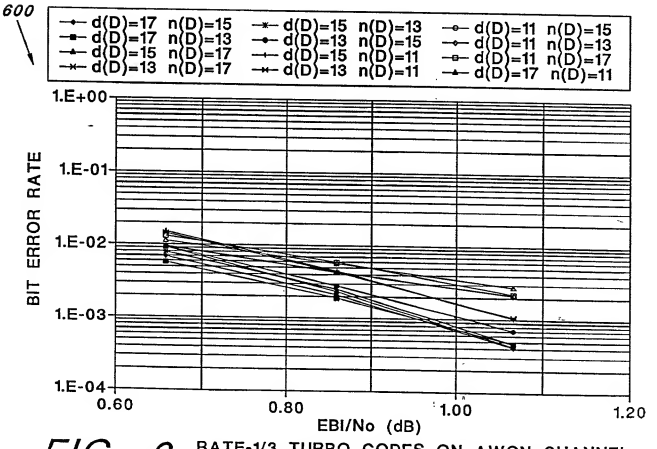


FIG. 6 RATE-1/3 TURBO CODES ON AWGN CHANNEL. (1000 BIT INTERLEAVER, 3 ITERATIONS)

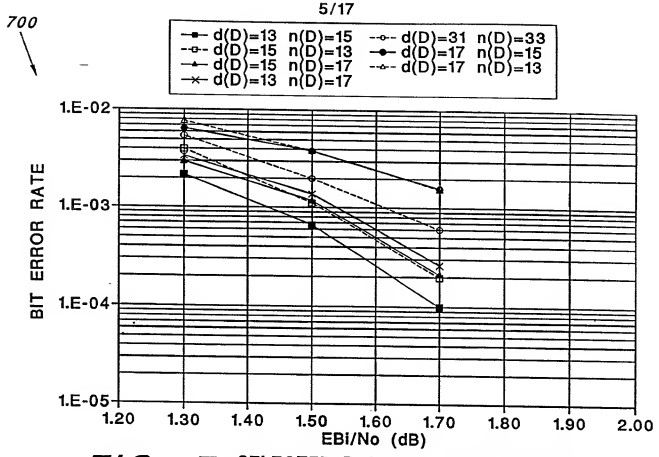


FIG. 7 SELECTED RATE 1/2 TURBO CODES ON AWGN CHANNEL, 512 BIT FRAME SIZE

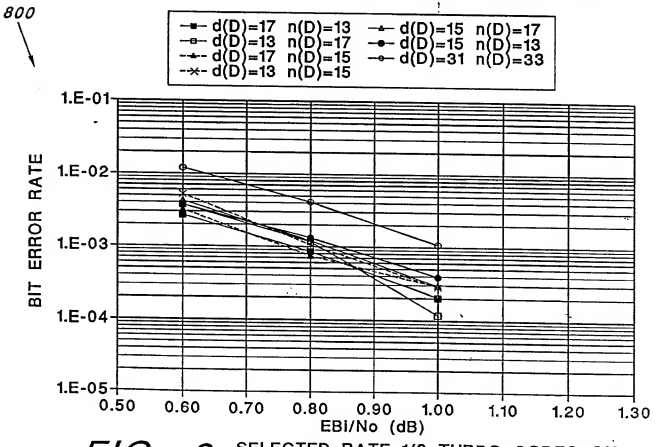


FIG. 8 SELECTED RATE 1/3 TURBO CODES ON AWGN CHANNEL, 512 BIT FRAME SIZE

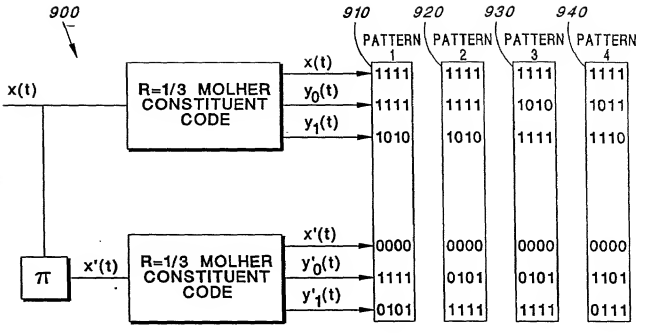


FIG. 9 PUNCTURING SCHEMES STUDIED FOR OPTIMIZING THE RATE 1/4 TURBO CODE

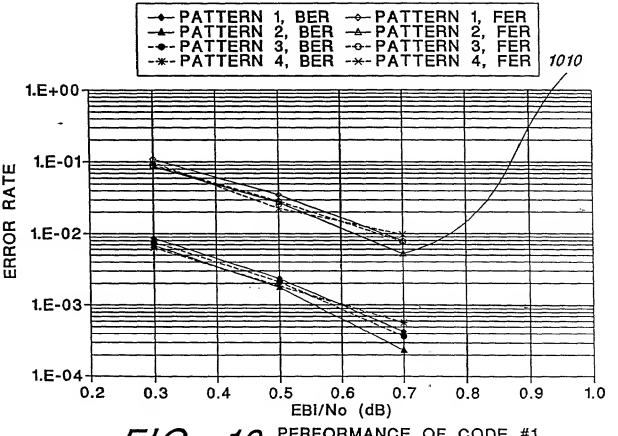


FIG. 10 PERFORMANCE OF CODE #1, FRAME SIZE=512

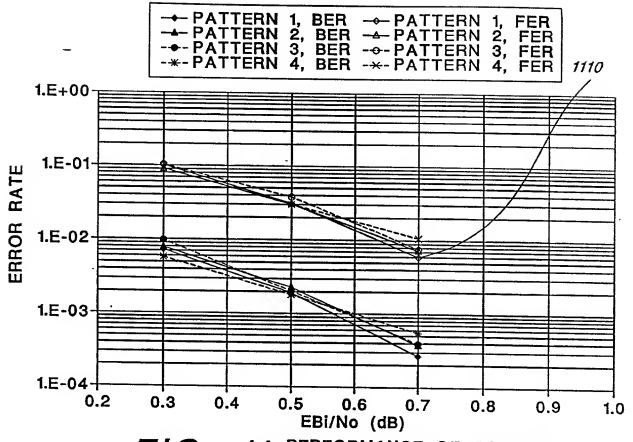


FIG. 11 PERFORMANCE OF CODE #2, FRAME SIZE=512

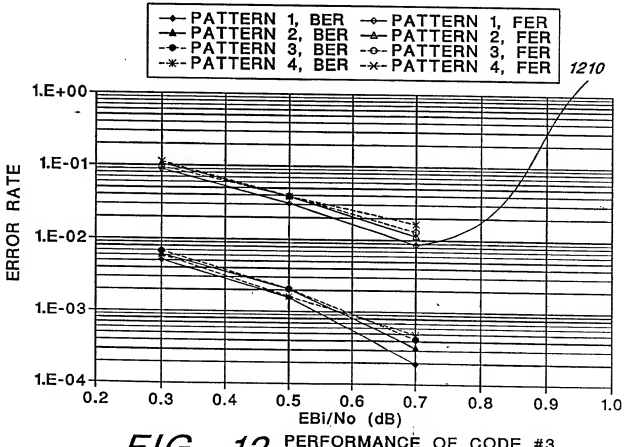


FIG. 12 PERFORMANCE OF CODE #3, FRAME SIZE=512

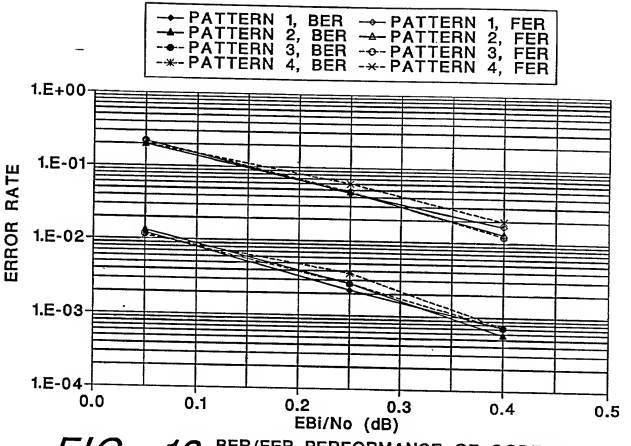


FIG. 13 BER/FER PERFORMANCE OF CODE #1, FRAME SIZE=1024

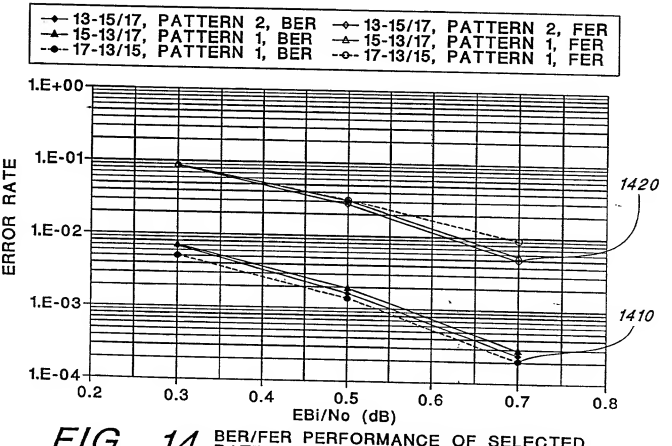


FIG. 14 BER/FER PERFORMANCE OF SELECTED RATE-1/4 TURBO CODES, FRAME SIZE=512

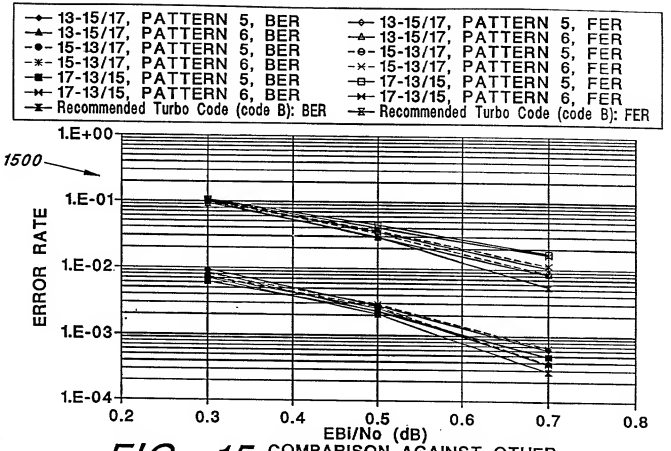


FIG. 15 COMPARISON AGAINST OTHER PUNCTURING SCHEMES, FRAME=512

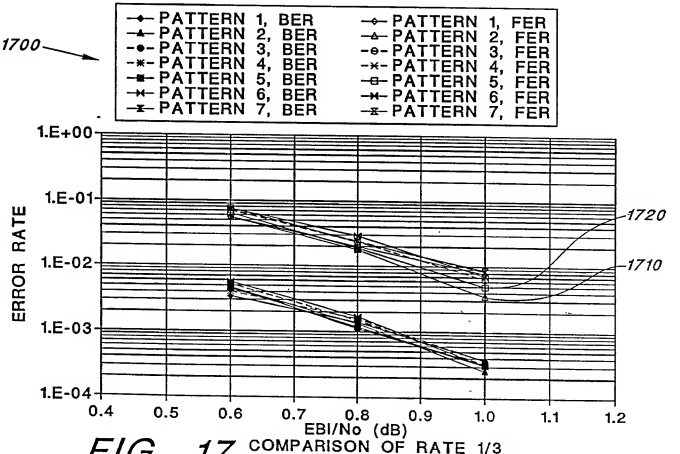


FIG. 17 COMPARISON OF RATE 1/3 PUNCTURING SCHEMES, FRAME=512

1600

1602 PATTERN 1	1604 PATTERN 2	1606 PATTERN 3	1608 PATTERN 4	1610 PATTERN 5	1612 PATTERN 6	1614 PATTERN 7	
1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1 — 1620	
1 1 1 1	0 0 0 0	1 0 1 0	1 1 1 0	1 1 1 1	1 1 1 0	0 0 0 1 — 1622	1616
0 0 0 0	1 1 1 1	0 1 0 1	0 0 0 1	0 0 0 0	0 0 0 1	1 1 1 0 — 1624	
0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0 — 1626	
1 1 1 1	0 0 0 0	1 0 1 0	0 0 0 1	0 0 0 0	1 1 1 0	0 0 0 1 — 1628	1618
0 0 0 0	1 1 1 1	0 1 0 1	1 1 1 1	1 1 1 1	0 0 0 1	1 1 1 0 — 1630	

(a) TURBO CODE RATE = 1/3

1640 PATTERN 1	1642 PATTERN 2	1644 PATTERN 3	1646 PATTERN 4
1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1
1 0 1 0	0 0 0 0	1 0 0 0	1 0 1 0
0 0 0 0	1 0 1 0	0 0 1 0	0 0 0 0
0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
0 1 0 1	0 0 0 0	0 0 0 1	0 0 0 0
0 0 0 0	0 1 0 1	0 1 0 0	0 1 0 1

(b) TURBO CODE RATE = 1/2

FIG. 16 ESSENTIAL PUNCTURING PATTERNS FOR RATE 1/3 COSTITUENT CODES

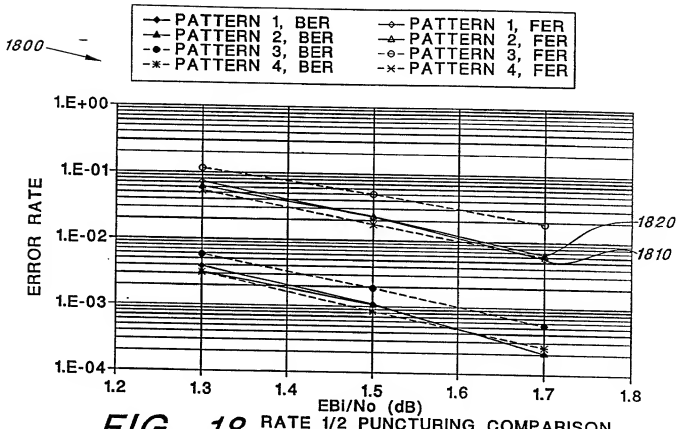


FIG. 18 RATE 1/2 PUNCTURING COMPARISON, FRAME=512

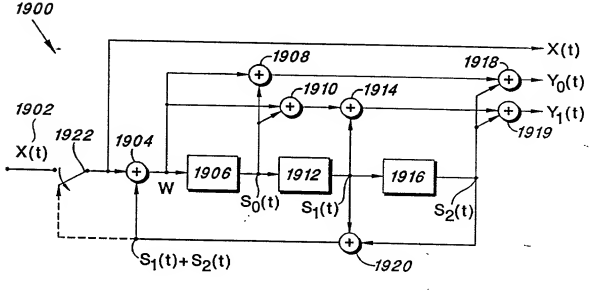


FIG. 19 UNIVERSAL CONSTITUENT ENCODER RECOMMENDED FOR FORWARD LINK TURBO CODES OF VARYING INTERLEAVER DEPTH

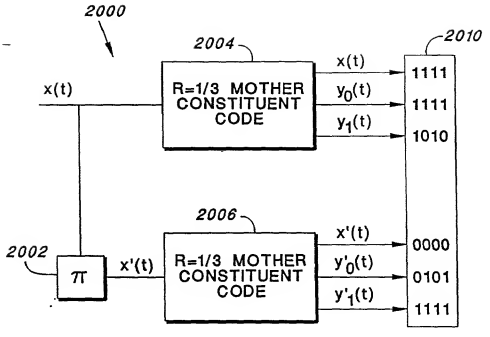


FIG. 20 FORWARD LINK TURBO CODE OF RATE 1/4 (MOTHER CODE IN FIGURE 19)

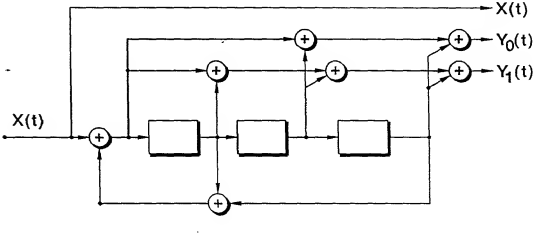


FIG. 25 CONSTITUENT ENCODER FOR REVERSE-LINK TURBO CODE

PATTERN 1	PATTERN 2
111	111111
11$\bar{1}$	111110
000	000000
000	000000
110	110111
000	000000

PUNCTURING PATTERNS FOR RATE 3/8 FORWARD LINK CODES

FIG. 21

PATTERN 1	PATTERN 2
1111	11111111
1101	11011010
0000	00000000
0000	00000000
1010	10101101
0000	00000000

PUNCTURING PATTERNS FOR RATE 4/9 FORWARD LINK CODES

FIG. 23

PATTERN 1	PATTERN 2	PATTERN 3
1111	1111	1111
1111	1011	1111
1011	1111	1011
0000	0000	0000
1111	1110	1110
1110	1111	1111

PUNCTURING PATTERNS FOR RATE 2/9 REVERSE LINK CODES

FIG. 27

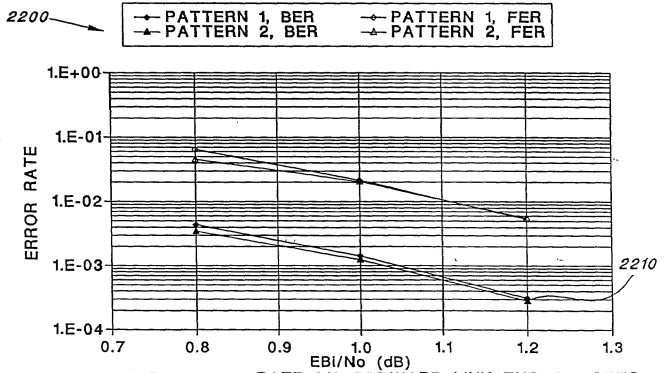


FIG. 22 RATE 3/8 FORWARD LINK TURBO CODES, FRAME=512, AWGN CHANNEL

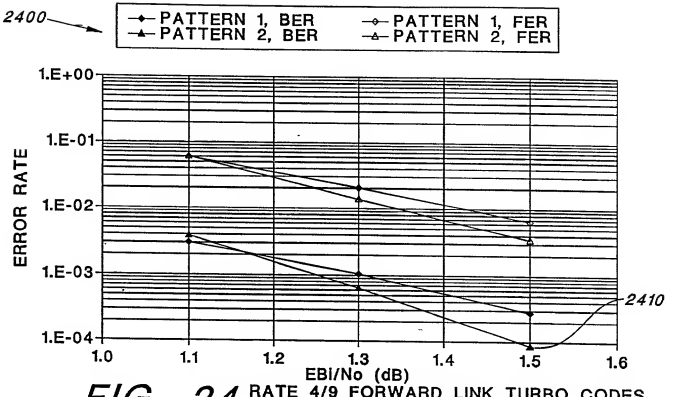


FIG. 24 RATE 4/9 FORWARD LINK TURBO CODES, FRAME=512, AWGN CHANNEL

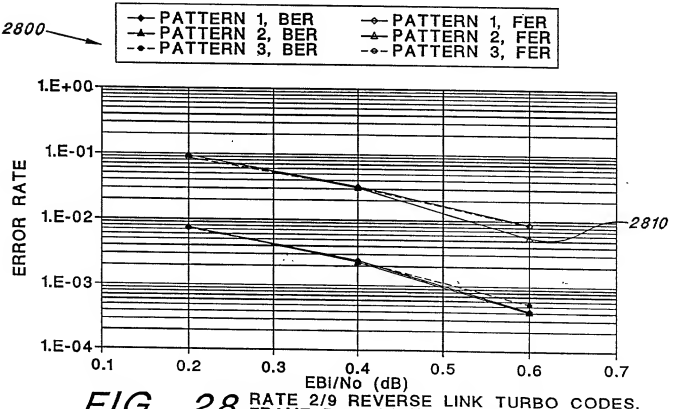


FIG. 28 RATE 2/9 REVERSE LINK TURBO CODES, FRAME=512, AWGN CHANNEL

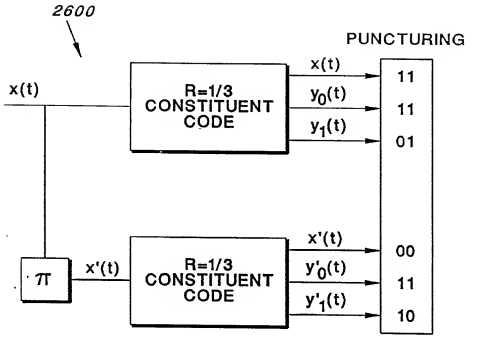


FIG. 26 REVERSE LINK TURBO CODE OF RATE 1/4 (MOTHER CODE IN FIGURE 25)

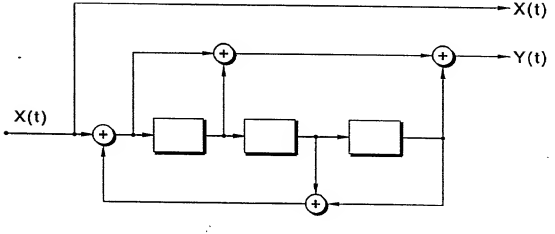


FIG. 31 UNIVERSAL CONSTITUENT ENCODER RECOMMENDED FOR R=1/2 AND R=1/3 TURBO CODES OF VARYING INTERLEAVER DEPTH

PATTERN 1	PATTERN 2	PATTERN 3
111	111	111
111	110	110
000	001	001
000	000	000
110	110	010
000	000	100

PATTERN 4	PATTERN 5	PATTERN 6
111	111	111
100	100	000
011	011	111
000	000	000
010	000	000
100	110	110

INITIAL PUNCTURING PATTERNS
FOR RATE 3/8 REVERSE LINK CODES

FIG. 29

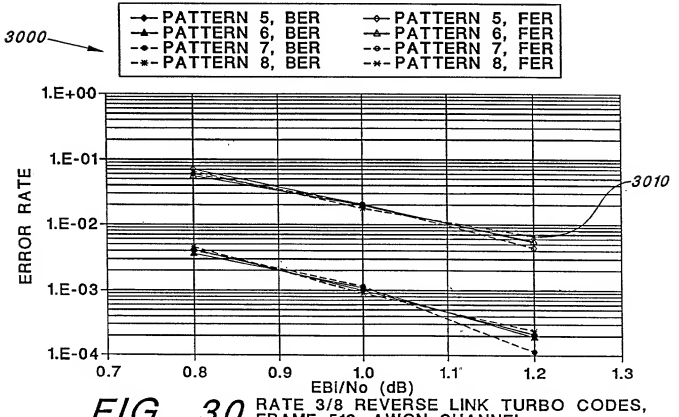


FIG. 30 RATE 3/8 REVERSE LINK TURBO CODES, FRAME=512, AWGN CHANNEL

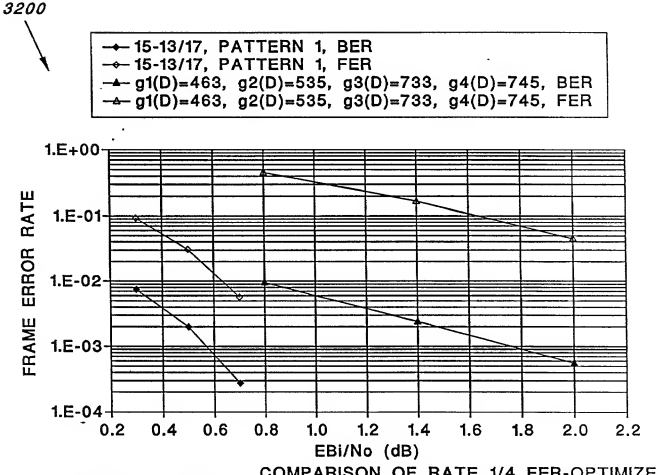


FIG. 32 COMPARISON OF RATE 1/4 FER-OPTIMIZED TURBO CODE VS CONVOLUTIONAL CODE, FRAME SIZE=512